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ABSTRACT

Training directors or managers of 160 major corporations of the "Fortune 500" were surveyed to assess the scope of computer use in the training domain; information was received from 56 of the companies. The study focused on five major areas: training applications, hardware, software, courseware, and number of students involved. An analysis of the data collected indicates that (1) the use of computer-based training (CBT) is becoming more commonplace in business and industry; (2) technical skills and management training are the most common uses; (3) the APPLE II is the most prevalent microcomputer in use; (4) software/courseware is primarily internally developed; (5) simulation is the most common instructional strategy used; (6) many of the efforts involve large numbers of employees; and (7) some companies are adopting a phased approach to the integration of CBT. Examples of microcomputer-based training projects in several corporations are described. Future prospects in microcomputer-based training are also discussed, e.g., the use of videodisc, videotext and videoconferencing services, and embedded training. Seven references are listed. (CHC)

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THE USE OF MICROCOMPUTERS FOR TRAINING:

BUSINESS AND INDUSTRY

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PREFATORY NOTE

This paper was developed as part of an ongoing HumRRO effort to document and disseminate information about applications of new technology in the education and training domain. The use of microcomputers in training is the focus of this report.

Two other recent HumRRO Professional Papers which may be of interest are: "It's 1980: Do You Know Where Your Computer Is?" by Robert J. Seidel (HumRRO PP-1-80), and "An Approach to Integrating Computer Literacy Into the K-8 Curriculum" by Beverly Hunter (HumRRO PP-2-80).

MICROCOMPUTER-BASED TRAINING IN BUSINESS AND INDUSTRY: PRESENT STATUS AND FUTURE PROSPECTS

In the past decade, computers have come to be widely used in business and industry for a diverse range of applications. It is estimated that almost 80% of present jobs involve some type of computer interaction. On the basis of these two facts, two inferences can be made first, that the use of computers for training purposes will become increasingly important and, second, that "computer literacy" will soon be considered a critical employee skill.

With the widespread availability of inexpensive microcomputers, the use of computers for instructional purposes has increased dramatically in the public education domain. For example, a recent survey conducted by the ACM Committee on Computing in Secondary/Elementary Schools (Chambers & Bork, 1980) found that of 974 school districts in the U.S., 90% of these districts used computers; 74% of this usage was instructional in nature. Instructional use of computers had increased from 13% in 1970 to 74% in 1980. Most of the programs being used involved a drill-and-practice strategy, were written in BASIC, and were acquired from outside.

Microcomputers have also had a dramatic impact in the business domain. It is estimated that almost 750,000 business persons are currently using microcomputers (Seaman, 1981). While many of these machines are being used by small companies for data and word processing applications, a significant proportion are being used by corporate managers and executives as personal tools for project tracking, budgeting and planning, and financial forecasting purposes.

Given this information on the prevalence of microcomputers in the school system and in the business world, the question arises as to the current impact of microcomputers on training activities. The present report is an attempt to present a state-of-the-art description of microcomputer-based training in business and industry. The report also considers possible future developments in this domain.

SURVEY OF MICROCOMPUTER-BASED TRAINING

In order to assess the scope of microcomputer use in the training domain, training directors or managers of 160 major corporations of the "Fortune 500" were contacted by mail or telephone. Information was provided by 56 of these companies (35% response). Figure 1 shows the results. Out of the 56, 19 companies indicated that they were not projecting use of computers in their training activities at the present time, 9 companies indicated that they were investigating their use, and 28 companies indicated that they were using computers for training applications. Of the 28, 20 reported the use of microcomputers, usually in addition to the use of large mainframes. Thus, on the basis of our sample data, approximately 50% of the organizations responding were using computers for training, and 71% of these included the use of microcomputers. Figure 2 lists the names of these companies.

No Projected CBT	19	(34%)
Investigating CBT	9	(16%)
Using CBT	28	(50%)
Using Micro CBT	20	(36%)

Figure 1 – **Results of CBT Survey**
(Total Respondents = 56)

Aetna	General Dynamics	Phillip Morris
American Express	General Electric	Shell Oil
AT&T	GTE	SDC
Boeing	Guaranty Mutual	Texas Instruments
Cessna	IBM	United Airlines
Control Data	INA	United Technologies
Exxon	Kodak	Western Electric
Frito Lay	Logicon	Xerox
Ford Motor Company	Mobil	
Ford Aerospace	Monsanto	

Figure 2 – **Companies Surveyed Who Are Active in CBT**

While we suspect that these percentages are biased in favor of computer-based training (since those involved in computer-based training are probably more likely to respond than those who aren't), the data suggest that computer-based training has become very prevalent in major organizations. A study carried out in 1980 (Vaughan, 1981) surveyed 113 companies and found the use of computers in training to be 21%. A study of 400 companies in 1978, found about 10% utilization of computers for training (Rahmlow, 1980). While the companies sampled were not identical in each study, the data suggest that computer-based training has increased substantially during the last few years.

In our study, we asked about five major areas: training applications, hardware, software, courseware, and number of students involved. We found five major kinds of applications: technical skills training, management/sales training, clerical/administrative training, programming/computer literacy, and training management (including testing). Of these five application areas, technical skills training was the most common application, representing about 71% of the uses reported (see Figure 3). The hardware included APPLE IIs, Radio Shack TRS-80s, IBM 5110s, Micro PLATOs, Regency Carroll, and a number of custom-designed systems. APPLEs were the most commonly used microcomputer. Software was either developed internally, custom-developed by an outside consultant, or bought "off the shelf." Internally developed software/courseware was

reported by more than half the companies. Instructional strategies involved were simulation, exercises, drills, tutorials, job aids, and data management. Simulation was the most common strategy. The total number of students involved in CBT at each company ranged from 12 to 10,000 with a typical involvement of about two hundred employees.

Areas	% Companies
Technical Skills	71
Management/Sales	29
Administrative/Clerical	20
Programming/Computers	39
Training Management	21
Uses	
Simulations	79
Tutorial	36
Drills	14
Job Aids/Administrative	32
Problems/Tests	50
Systems	
PLATO	21
IIS/SCHOLAR	21
APPLE	21
TRS-80	14
Custom-designed	18
Other	32

Figure 3 – **Results of CBT Survey**

(N = 28 Companies)

We also found that within some of the companies which are investigating the application of CBT, the necessary first steps are underway. That is, current training materials are being revised to fit a criterion-referenced instruction approach; objectives and criterion tasks/tests are being written and implemented. Many of the training programs are being modularized which will permit an easy, step-by-step transition to CBT.

To summarize these data, it appears that:

- The use of computer-based training is becoming more commonplace in business and industry;
- Technical skills and management training are the most common uses at present;
- The APPLE II is the most prevalent microcomputer in use;

- Software/courseware is primarily internally developed;
- Simulation is the most common instructional strategy used;
- Many of the efforts involve large numbers of employees;
- Some companies are adopting a phased approach to the integration of CBT.

This picture differs significantly from the present use of microcomputers in public education in the nature of the application areas (technical and management skills versus basic skills), in the most common instructional strategies in use (simulation versus drill), and the predominant source of the software/courseware (internally developed versus "off the shelf").

SOME EXAMPLES

This section describes some examples of microcomputer-based training projects at the corporations included in the survey. The intent of these examples is to provide brief snapshots of how microcomputers are being used in business and industry.

Xerox Corporation provides a good example of how microcomputers can be used for a number of different training applications within a large company. One project involves a prototype adaptive testing system which will be used to pretest students for basic sales training. By locating the microcomputers in branch offices, it can be determined whether students have completed their self-study preparation for sales training courses to be taken at a central training facility. This adaptive testing technique reduces the amount of time needed for testing. A second project involves tutorial instruction for service representatives. It includes subjects, such as Service Call Management, Machine Installation Procedures, Technical Updates, and Reported Field Problems. A third application involves training retail store employees how to demonstrate the equipment sold in Xerox stores. This includes how to use and program the APPLE microcomputer.

Boeing Aerospace is another example of how microcomputers are being used for diverse training applications. Boeing provides a course for technical staff in microcomputer fundamentals using the KIM (Commodore) and INTEL 8080A kits. Radio Shack TRS-80s are used for programming instruction. Micro- and minicomputers are used to manage training activities; to produce class schedules, training forecasts, course descriptions or indices, utilization statistics, and budget reports. One particularly innovative project at Boeing involves allowing students to take portable terminals home for training purposes. The full range of computer-based training activities at Boeing are discussed in Clogston (1980).

At the General Electric Executive Education Center, microcomputers have been used for more than a year now as part of the management education program. They are used by the managers as a tool to solve basic financial problems and understand business concepts. They also are used to store and report administrative data. At INA, APPLEs are used for similar applications in their management training center, including their use for classroom support activities, such as scheduling.

Another insurance company, Guaranty Mutual, has been using TRS-80s as part of its sales training program. The microcomputer is used to provide simulated selling situations, as well as a tool for account tracking by agents. The head office of Guaranty Mutual provides the program, and the individual offices buy their own machines. This particular implementation strategy seems to be a good one, since it allows field offices to make their own decisions regarding the presence and number of machines, and takes advantage of the programming/educational expertise of the head office.

A number of organizations are exploring the use of microcomputers for technical skills training. For example, the Customer Equipment Service Division of Eastman Kodak Company has been investigating the use of APPLEs to provide equipment troubleshooting practice for service representatives. Schematics of equipment are displayed on the screen, and a light pen is used to measure voltages. When a malfunction is located, the light pen becomes a soldering iron which can then be used to repair or replace the faulty component. This kind of simulation gives trainees a good deal of hands-on type practice while avoiding the safety problems and costs associated with real equipment.

At Texas Instruments microcomputers and the PLATO system are being used for technical training. This includes the remote instruction of field engineers, operator training for manufacturing equipment, and programming language instruction. Mobil Oil has been investigating the use of Regency Carroll microcomputers for operator training. Ford Motor Corporation, Philip Morris, and General Dynamics are using APPLEs or Radio Shack microcomputers for a variety of technical training applications.

Other organizations are using microcomputer systems for clerical or administrative training. This is particularly true for financial service companies which are now heavily dependent on computer systems for their operation. For example, AETNA Insurance Company is using IBM 5110s to teach agents how to rate policies. Results show that agents are able to do this in much less time with fewer problems than before the use of the computer. American Express Company is using specially designed microcomputer-based simulators to teach data entry and inquiry skills for the IBM Series/1 computer. The microcomputer allows complete simulation of the actual job with embedded pre- and posttests.

These examples provide a quick glimpse of how microcomputers are being used for training applications in major corporations. Many of these efforts are exploratory in nature; however, a few are already an integral part of training programs. Major application areas include technical skills training, management sales training, administrative/clerical training, programming/computer principles, and training management.

FUTURE PROSPECTS

There are a number of emerging technical developments which will likely effect the course of microcomputer-based training in the next few years. One of these is the use of videodisc in conjunction with a microcomputer to provide interactive, multi-media instruction. In fact, a number of companies described in this report have pilot projects involving interactive videodisc instruction. This development will ultimately bring together the computer and media-oriented training enthusiasts and greatly strengthen the support for educational technology.

A second important technological development is the blossoming of videotext and videoconferencing services during the 80's. It seems very likely that these information networks will be used for educational and training purposes. They would seem like good mechanisms for companies to provide decentralized training, particularly if the microcomputers are already available in the offices. A further extension of this decentralization trend is the flexibility to allow employees to work or train in their homes. Some companies, such as Control Data, already have home-based learning programs for disabled employees (CDC Contact, 1980).

A third important technological development is the increasing prevalence of embedded training, i.e., equipment which has its own instruction built in. For example, many computer-based systems now come with instructional software/courseware designed to teach users how to operate or maintain the system. Microprocessors will allow this kind of embedded training to be built into a wide range of consumer products. With this development, people will gradually become used to obtaining instruction from a machine.

To a great extent, the future prospects for the use of microcomputers in training are a function of how the current problems and limitations are dealt with. Many problems associated with the use of microcomputers in training are not unique to microcomputers. They are related to the introduction of technology, the attempt to innovate or the use of individualized instruction. For example, one major problem reported is resistance to the use of computers (of any type) for instruction either by trainees, trainers, or managers. Companies find that individuals who are positive towards computers find computer-based training worthwhile; those who have negative attitudes, dislike or find fault with the use of computers.

Other problems are specifically related to computer-based training. The high cost and long development time needed for the creation and testing of computer-based curricula are serious obstacles to the widespread use of computers in training. The courseware development problem is probably more acute in the training domain than in public education since most training materials must be custom developed for a particular company; off-the-shelf materials will seldom be appropriate. One possible solution to this problem is the use of authoring systems which can significantly speed up the development process. Increasingly powerful authoring systems for microcomputers are being developed as the demand for courseware increases.

Another major problem which must be addressed is limited capability of currently available microcomputers relative to the processing and storage requirements of training applications. The most frequent type of strategy being used in basic skills curriculum, namely drills and tutorial, do not involve great processing and memory requirements. Consequently, the current machines have enough capability for most current school applications. However, the most common application in the training domain is simulation, and this typically requires considerable processing power and memory. As the requirements for graphics and voice input/output become more demanding, much greater capabilities will be needed. While the prospect of increasingly greater processing power and memory for microcomputers looks good, the worry is that these improvements will not keep up with the needs.

As a footnote, it is worth pointing out that the major problem with computer-based training in the past, namely the high cost of the hardware, has all but been eliminated

by microcomputers. Microcomputers are sufficiently inexpensive that individual offices are able to purchase them, more or less as they would buy any piece of office equipment. The great political campaigns needed to acquire computers in the past have largely been obviated by the low capital investment related to microcomputers. This means that computer-based training is now a possibility for any company that is interested.

The driving force behind the increasing use of computer-based training is primarily economic (Norris, 1978). As the labor costs associated with "live" instruction and the expenses associated with travel to a centralized training facility continue to increase, the use of computer-based instruction in distributed learning environments (e.g., branch offices or home) becomes more attractive. Furthermore, since this instruction is likely to have been systematically designed and developed, it typically will result in better training than "traditional" classroom instruction. Indeed, much of the effectiveness of computer-based training has to do with the systematic approach to the design and development of the materials, not the computer delivery itself.

All indicators suggest that the current economic pressures will prevail in the future. Consequently, there will be continued emphasis on increasing productivity in all facets of an organization, including training. Corporations will be looking closely at the potential of computer technology to improve the effectiveness and efficiency of their training operation and on-the-job productivity. It would seem that microcomputers will have an important role to play in future training systems.

REFERENCES

CDC Contact. Home Work. March 1980, 1-7.

Chambers, J.A., & Bork, A. Computer assisted learning in U.S. secondary/elementary schools. *The Computer Teacher*, 8(1), December 1980, 50-51.

Clogston, T. CBI for a high-tech industry. *Instructional Innovator*, September 1980, 22-24.

Norris, W.C. Computer technology, education, and the bottom line. *AEDS Monitor*, 17(4), 1978, 7-5.

Rahmlow, H.F. To CAI or not to CAI. *NSPI Journal*, 19(1), February 1980.

Seaman, J. Microcomputers invade the executive suite. *Computer Decisions*, February 1981.

Vaughan, T.W. Media in corporate training. *Instructional Innovator*, January 1981, 24.